

**Safe Work Requirement**

H2S Contingency Plan

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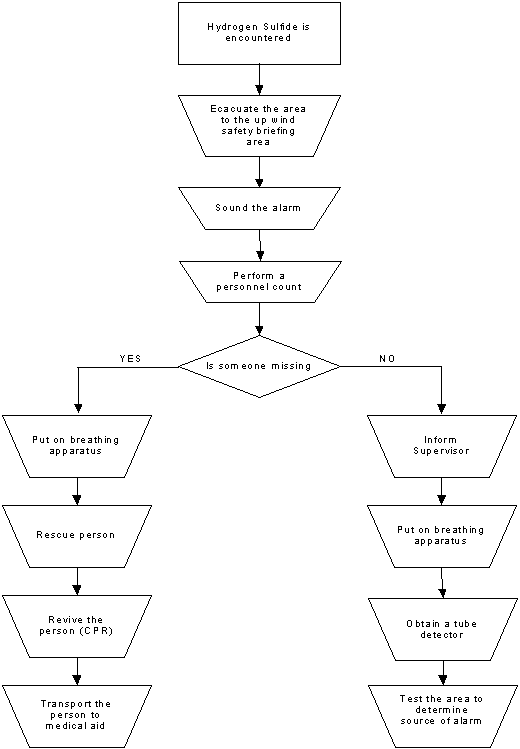
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| PURPOSE Within certain areas, hydrogen sulphide has been encountered in large quantities in crude oil and natural gas.  In addition to occurring naturally in crude oil and natural gas, hydrogen sulphide can be produced under the following conditions:   1. Decomposition of organic materials such as sewage. 2. Substantial amounts of hydrogen sulphide can be produced by bacterial action in seawater that has become stagnant.   The objective of this procedure is to familiarize all members in ECDC work site with H2S contingency plan in place to facilitate safe orderly and timely. SCOPE At locations where hydrogen sulphide is known or suspected to exist, contingency plans and training programs will be set up for all personnel involved. This plan provides information for personnel who work at these locations. HYDROGEN SULFIDE GAS      General Hydrogen Sulphide ( H2S ) or "sour gas" is a poisonous, flammable gas which is frequently encountered in petroleum drilling. Its presence, in relatively low concentrations, can quickly cause unconsciousness and death. It is essential that all personnel are aware of its hazards and are instructed in the proper safety procedures in order to avoid its effects.  The best line of defence against H2S is adherence to good drilling practices and good well control procedures.  Following are facts concerning H2S that all employees should know:   1. H2S is generally recognized by its characteristic foul odour, resembling rotten eggs. However, a high concentration of the gas instantly paralyzes the sense of smell and prolonged exposure to low concentrations has the same effect. Therefore, the sense of smell is an unreliable way of detecting and monitoring the presence of H2S. 2. Hydrogen sulphide is heavier than air. This makes it especially dangerous, as this property causes the gas to accumulate in low or enclosed areas. 3. H2S forms an explosive mixture in air or oxygen within the range of 4.3 to 46 percent by volume; thus, the gas presents both a toxic and fire hazard to the rig at the same time. 4. H2S is water-soluble, and has an ignition temperature of 500 degrees F. 5. H2S irritates the eyes and respiratory system. When high concentrations are present, death caused by lung paralysis can occur in a very short time.  Exposure Limits And Physiological Responses In air hydrogen sulphide concentrations are measured in parts per million (PPM) on a volume-to-volume basis. In water the concentrations are measured in milligrams per litre (ml/l) on a weight to volume basis.  **Refer to BSA-ECDC-HS-SWR-S009-01-H2S Safety Procedure Version A, Appendix 3 - H2S toxicity table** Detection and Measurement of H2S Every rig was equipped with at least one tube type detector (Sensidyne). A stock of tubes must also be maintained. At the start of an operation the tubes should be checked to ensure that:   1. The tubes are of the same manufacture as the air pump. 2. The expiration date on the tubes has not been exceeded. 3. Tubes are made to sample many gases. Ensure the tube you are using is for H2S. 4. The range of the tubes will measure the concentrations. 5. Check the tube’s instructions to determine the number of pump strokes required to obtain the best reading. 6. The tubes have been stored according to the manufacturer's specifications, generally upright in a cool dark place not exceeding 25 C.   Prior to using the pump, an air tightness test shall be done on the pump. The date and results of the test should be recorded and the record stored with the pump. The test should be done in accordance with the manufacturer's specifications.  Portable Electronic Personal Monitors are to be present at 10 ppm and should have both visual and audible alarms. The following pre-service check will ensure the unit will function properly:   1. Check the battery. 2. Check the temperature calibration. 3. Test the unit by exposing the sensing head to H2S calibration gas. 4. Ensure the monitor is held or mounted at waist level and that clothing will not obstruct the sensing head.   **NOTE**: before entering an area to check the concentration of h2s， a breathing apparatus must be put on and used for the duration of the test.  Crewmembers must be trained in the use of a tube and pump type detector.  All gas detection equipment must be tested and inspected before start-up new location. In addition, this detection and measurement system must be calibrated as per manufacturer’s recommendations and readily available. Pre-Well Planning Safety in a hydrogen sulphide environment depends on being fully prepared for an H2S encounter before it occurs. This involves having a sound contingency plan and ensuring that all personnel are adequately trained in the areas of H2S detection, control, use of personal protection equipment and first aid as applies to H2S. A good H2S contingency plan consists of three parts:   1. H2S Detection - Detection equipment must be effectively placed and properly maintained, and checked. 2. Protection - Planned protective measures to be implemented: 3. Don SCBA 4. Secure the well 5. Personnel move to assembly points 6. Evacuation - Planned evacuation procedures for evacuation of non-essential personnel, and all personnel (if the rig crew if unable to control the well).  Precautionary Measures  1. The rig positioning shall be planned so that prevailing winds blow any gas away from occupied work and living areas. 2. Breathing apparatus and other safety gear shall be positioned upwind of the well bore, and shall be capable of being relocated in case of shifts in wind direction. 3. There shall be several designated and marked "assembly/muster areas" strategically located so that one will always be upwind. 4. Wind socks or flags shall be installed in several visible locations, enabling all personnel to determine wind direction in the event of H2S release. They shall be illuminated at night. 5. All electric wiring, devices and lights shall be explosion-proofed to reduce the possibility of explosion. Any heaters used must be of flame proof type. 6. Windbreaks shall be removed if the possibility of encountering H2S exists. 7. Fans shall be used on the rig floor, the shaker pits and the mud room to prevent accumulation of gas in these areas. 8. Contact lenses can not be worn with breathing apparatus. 9. All special equipment, such as flare ignition devices, H2S detector devices and breathing equipment must be carefully maintained in operating condition at all times. 10. Where H2S is known to be present, H2S drills will be conducted as well as rig supervision is satisfied that everyone is properly trained. Once this readiness is achieved, they can be alternated with other drills, but in no case shall they be held less than once a week in possible H2S areas. 11. The rig shall be equipped with an H2S detection system, with sensors located in areas where H2S is most likely to accumulate, such as the shale shakers, the mud tanks and the rig floor. The detection system shall activate a visual alarm light of H2S concentration reach 10 ppm, and an audible alarm shall sound when H2S concentration reaches 20 ppm.  Emergency Measures The following are procedures to follow when the presence of H2S is known or suspected:   1. The well shall be shut in and all personnel moved out of all low or enclosed areas, such as BOP deck, mud tanks and shale shakers. If available, all personnel will don breathing apparatus sets. 2. Tests shall be made immediately using the portable toxic gas detector to verify the presence and concentration of the gas. 3. Personnel shall watch out for each other. Where possible, they shall work in pairs. 4. Be aware that the lower explosive limit of H2S is 4.3% by volume (43,000 ppm), and in the event that concentrations threaten to approach that limit, all non-explosive proof electrical and flame producing equipment should be turned off to reduce the fire and explosion hazard. If H2S is combined with natural gas, the lower explosive limit will be lower. 5. If the presence of a potentially dangerous concentration of H2S is confirmed, personnel shall move to a high, ventilated location, upwind of the well. If the situation allows, all non-essential personnel shall be evacuated to the standby boat or the life boats. If the drill crew is unable to control the well, all personnel are to be evacuated. 6. If a man has been overcome, no one shall attempt to rescue him without first putting on a breathing apparatus; otherwise, the rescuer may also become a victim. 7. Never enter an enclosed area where H2S may be present without wearing proper respiratory protective equipment. If the worker is over an arm's length away, a safety belt shall be secured to a life line and held by a responsible person who is in the clear. 8. The base office and nearby medical facilities shall be notified and standing by. 9. Warning notices shall be posted at the perimeter of the area, warning of the H2S danger. 10. If gas is burned during testing operations, a blue flame can be an indication of the presence of H2S. This must be tested to confirm the presence of H2S. If H2S is present, do not leave the flare unattended as it must be shut down if it goes out.  Breathing Apparatus  1. Every rig shall be equipped with at least ten (10) SELF CONTAINED BREATHING APPARATUS. The breathing apparatus shall be stored where they are readily accessible. Crews shall be trained in the use, care and cleaning of the apparatus. 2. Breathing apparatus shall be a positive pressure type unit. The air supply shall be rated as a thirty (30) minute supply; pressure shall be 200BAR (20 MPa). Units are to be stored with fully pressured cylinders. There shall be at least one spare, fully charged cylinder for each breathing apparatus or have immediately available the facility to recharge spent cylinders. 3. Breathing apparatus maintained for emergency use shall be inspected by a competent person at least every thirty (30) days or at the start of an operation, whichever comes sooner. The results of the inspection shall be recorded on Monthly S.C.B.A. Inspection Report and will be maintained in the HSE files in the Rig Managers office. 4. After each usage the apparatus is to be inspected, cleaned and sanitized. The rubber goods of the face piece are to be cleaned with warm detergent water and a stiff bristle type brush. After washing, the face piece is to be rinsed in clear water, then sanitized. Sanitizing is to be done with a 10% solution of chlorine bleach, or other suitable sanitizing solution. (face pieces should not be sanitized with bleach). The face piece is to be immersed in this solution for ten (10) minutes, rinsed in clear water and hung to dry. Do not hang to dry in direct sunlight. When the face piece is dry it should be stored in a closed plastic bag inside the breathing apparatus case. 5. When in an H2S environment, the most important item of safety equipment is the breathing apparatus. This equipment is worthless if it is not properly maintained or if personnel do not know how to use it. Breathing equipment usually consists of the self-contained type, with varying time limits, affording mobility to the wearer; and the cascade-type, having a number of air hoses and masks manifolded to a battery of air cylinders. This type permits working for relatively long time periods, but restricts the wearer to a certain area. All respirators to be used in anH2S environment must be of the pressure-demand type. 6. All personnel must be knowledgeable in the proper use of both types of systems. Important considerations in the use of breathing apparatus include the following: 7. Breathing equipment shall be inspected for serviceability and pressure checked before and after each use and at least monthly when not in use. 8. Personnel must not wear eyeglasses or contact lenses with breathing equipment. 9. In known H2S areas, personnel will not be allowed to wear beards and/or long sideburns which prevent proper sealing of the facemask. 10. All personnel must know the location of breathing equipment, know how to use it and have easy access to it.  First Aid for Hydrogen Sulfide The deadlines and swiftness of the effects of H2S poisoning require IMMEDIATE first aid for H2S victims following these procedures; however, no rescue attempt should be made without first donning a breathing apparatus.   1. Remove victim immediately to a fresh air zone. 2. Site medic and RM arrange evacuation to medical facility. 3. Maintain victim at rest and administer oxygen if available. 4. If patient is not breathing, begin artificial respiration immediately. Mouth-to-mouth resuscitation should be administered until an automatic resuscitation unit is available. Resuscitation of the victim should continue until either the victim begins breathing on his own, or until rig mortis sets in. 5. Keep patient warm. 6. When breathing is restored, give patient stimulants such as tea or coffee, but DO NOT leave patient unattended. 7. If eyes are affected, wash thoroughly with clear water (for slight eye irritation); cold compresses will help. 8. Patients shall be kept under medical observation until the doctor declares them fit to return to work. If a victim is removed to fresh air and normal respiration is restored, rapid recovery may be expected.   In cases of slight or minor exposure where the crew member has not be totally unconscious and wants to return to work after a short rest period, duty shall be postponed until the following day. Reflexes may not have returned to normal and the person could be subject to injury from other work hazards.  Rescue Breathing If there is a casualty to H2S, the casualty must be removed to a fresh air environment as quickly as possible. The casualty should have rescue breathing started and CPR, if required, as soon as possible.  If oxygen is available, after the casualty has started breathing on their own, oxygen should be administered. Oxygen should be administered by means of an inhalator. NO SMOKING IS PERMITTED WHEN OXYGEN IS IN USE. The H2S Emergency Response If H2S is encountered, the response procedure must be initiated immediately. |



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| when working in an h2s contaminated area, do not enter the area without the direction of a supervisor and the assistance of a safety back-up person. the safety back-up person is to maintain visual contact with the worker they are assigned to at all times. the safety back-up person should remain out of the contaminated area if possible, but should be wearing a breathing apparatus. |  |